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Review Article

The Assessment of Eating Behaviour in Children Who Are Obese: A Psychological Approach. A Position Paper from the European Childhood Obesity Group

Caroline Braet^a Grace O'Malley^b Daniel Weghuber^c Andrea Vania^e
Éva Erhardt^f Paulina Nowicka^g Artur Mazur^h Marie Laure Frelutⁱ
Elisabeth Ardelt-Gattinger^d

^aFaculty of Psychology, Ghent University, Ghent, Belgium, ^bChildhood Obesity Team, Temple Street Children's University Hospital, Dublin, Ireland, ^cDepartment of Paediatrics, Division of Paediatric Gastroenterology, Hepatology and Nutrition, Paracelsus Medical School, ^dFachbereich Psychologie, Universität Salzburg, Salzburg, Austria, ^eDepartment of Paediatrics and Paediatric Neuropsychiatry, 'Sapienza' University of Rome, Rome, Italy, ^fDepartment of Paediatrics, University of Pécs, Pécs, Hungary, ^gUnit of Paediatrics, Department of Clinical Science, Intervention and Technology (CLINTEC), Karolinska Institute, Stockholm, Sweden, ^hFaculty of Medicine, University of Rzeszów, Rzeszów, Poland, ⁱPaediatric Endocrinology Department, Bicêtre University Hospital, Le Kremlin-Bicêtre, France

Key Words

Children · Obesity · Psychological assessment · Eating behaviour

Abstract

Objective: This paper introduces health professionals to the different psychological models thought to influence eating behaviour in the absence of hunger in children who are obese and to propose a method of assessing these behaviours in practice. **Methods:** Clinical researchers from the European Childhood Obesity Group (ECOG) adopted an evidence-based approach to examine the literature concerning the assessment of eating behaviour in children who are obese. Studies published in English were filtered out of the medical and psychological literature from 1960 to the present, and the resulting bibliography was searched for relevant articles. Key themes from the current evidence were compiled and classified according to the underpinning psychological models. Based on the current evidence and the authors' combined clinical experience, a three-staged approach to assessment was agreed by consensus. **Results:** Valid and reliable tools for assessing and monitoring each of the three identified models (Dietary Restraint Theory, Emotional Eating and the Diathesis-Stress Model) are suggested for use in clinical practice, and the ECOG three-staged approach to assessing eating behaviours in the absence of hunger is described. **Conclusions:** This paper presents practical guidance on how to assess eating behaviour in the absence of hunger in children who are clinically obese and suggests a focus for future research.

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Grace O'Malley
Childhood Obesity Team, Temple Street Children's University Hospital
Temple Street
Dublin 1 (Ireland)
omalleyg@tcd.ie

Introduction

Overall a child's diet should consist of both a balanced macro- and micronutrient composition as well as a balanced eating behaviour. A balanced eating behaviour encompasses eating recommended portions at fixed hours guaranteeing healthy feelings of hunger and a routine that promotes physiological growth and energy expenditure. However, a trend of snacking in the absence of hunger is observed among families in western society that may contribute to obesity via the intake of excess energy [1].

The eating behaviour of obese children who are obese can be complex. It is known that individuals who are obese may display different eating behaviours in the absence of hunger, e.g., snacking after a meal; eating 'comfort food' when feeling unhappy; eating during the night; eating too much followed by vomiting; restrained eating and meal skipping [2]. If such eating patterns occur on a regular basis or deviate too much from the regular childhood eating guidelines, we describe these behaviours as eating disturbances [3]. Although in some cases the abnormal eating behaviour can be explained by a genetic pathology or a medical disease, usually psychological models offer a better understanding.

It is important to recognize eating disturbances and their psychological antecedents in children as in many cases weight management programmes are not developed for treating symptoms of eating disturbances [4]. In the short term, some intervention studies have observed a reduction in various measures of eating pathology [5]. However, this has not been observed in the long term [6]. Furthermore, for professionals like dietitians, general practitioners (GPs) and paediatricians it is sometimes difficult to understand and treat these eating behaviours, specifically when they are related to psychological factors. Moreover, disordered eating behaviours normally occur between the ages of 6 and 15 years [7, 8]. Hence, it is prudent that timely assessment of these behaviours and their potential psychological influences be undertaken so that their progression and the subsequent need for more intensive and expensive interventions can be avoided [7].

Therefore, the present paper aims to summarize the different disturbed eating patterns observed in paediatric obesity and to review our current understanding regarding the potential psychological antecedents of these eating behaviours for non-psychologists. We must recognize that, to date, no psychological factors are identified as etiological factors in childhood obesity. Such factors identified in the literature are, however, considered to be relevant to our understanding of the psychological comorbidities associated with obesity in youth. These models can guide an appropriately thorough psychological assessment when eating in the absence of hunger is suspected. We will discuss the models, the psychological factors and the specific outcome measures to be used in an assessment. Finally, issues related to screening in a paediatric setting are discussed. The present article will mainly focus on the potential antecedents of eating behaviour in the absence of hunger as they are behaviour-specific and not necessarily related to lifestyle behaviour in general.

Observations of Eating Behaviour in the Absence of Hunger

Several psychological frameworks have been proposed to describe the origins of disturbed eating behaviour, and we selected those that evidenced their assumptions with research in children with obesity. We will discuss these below according to a questioning format which might help GPs or paediatricians to screen for eating behaviour in the absence of hunger during a clinical visit. Remarkably, different eating disturbances can occur in the same person on the same day and can even be interrelated [2].

Binge Eating

Binge eating, defined as the ingestion of a large quantity of food accompanied by feelings of loss of control over eating, can be considered as a symptom or, when it occurs regularly, as part of a syndrome like bulimia nervosa (BN) or binge eating disorder (BED). This has recently been recognized in the DSM-5 [9]. Although binge eating can occur after feeling hungry, problematic binge eating episodes must meet three or more of the following additional criteria: eating until feeling uncomfortably full, eating large amounts of food when not physically hungry, eating much more rapidly than normal, eating alone due to embarrassment and feeling disgusted, depressed or guilty after overeating [10]. Binge eating episodes are reported in 9.3% of 'healthy' children and in up to 36.5% of children who are obese [7, 8]. According to representative European studies in youths who are morbidly obese (10–18 years), prevalence rates are approximately 10–24% for BED and 9% for BN. Although not yet fully recognized as a disorder, when binge eating occurs during the night, it is referred to as night eating syndrome (NES) [9].

Currently, at least two different models can explain binge eating depending on the observed antecedents: the dietary restraint theory (DRT) and the affect regulation theory (ART). Further psychological factors are still under study.

Restrained or Controlled Eating

Do you sometimes consciously try to limit, restrict or cut back the overall amount of food that you eat because you think this is better for your weight?

Both adults and children who are obese often report dieting attitudes and use of rigid weight loss practices and related weight fluctuations [11–13]. Whereas 'dietary restraint' refers to cognitive processes (like the cognitive preoccupation with weight, shape and food restriction), 'dieting' refers to the actual use of weight control practices to reduce caloric intake, i.e. the consumption of less than 1,200 kcal over a minimum period of 3 days. The present review includes both 'dieting' and 'dietary restraint' as separate and clearly defined variants of disturbed eating. We must acknowledge that being overweight in many people induces specific efforts to control their weight. GPs and dietitians regularly recommend dieting or 'controlling one's eating'. That entails a shift from a reliance on physiological cues of hunger and satiety to cognitive control (by the child/adolescent or by the parents) over the child's eating behaviour. In these cases, however, the cognitive control is often too strict and extremely vulnerable to disruption.

For a long time, the DRT was the leading theoretical psychological model that, based on several experimental studies, explained eating problems after following a strict diet [12]. These studies demonstrate that, after inducing emotional or cognitive loads, the cognitive control often fails resulting in an increased risk of overeating. Also, in children who are obese, dietary restraint attitudes and dieting behaviours are often observed and can be alternated with disruption and binge eating which paradoxically can lead to weight increase [7, 8, 12]. It is also hypothesized that failures of (rigid) restraint behaviour cause distress which in turn promotes more emotional eating and difficulties in discriminating real feelings of hunger and satiety. As a result, susceptibility to abnormalities in eating patterns is likely to increase, and strict dieting as well as dietary attitudes are therefore identified as 'risk variables for eating disturbances' [12]. Moreover, neurocognitive studies and cognitive research present an alternative approach based on the theory of thought suppression [14]. Thought suppression is seen as a mental control process that situates the individual into a modus of cognitive load. 'Control', with its necessity to maintain 'restrained eating' at the

meta-level, describes how the human brain is principally unable *not* to think about something. Every ‘control’ thought, like ‘I am *not* going to eat chocolate and chips now’, activates an image of chocolate etc. in the brain, similar to a search command on a computer for ‘NOT obesity’ which will open all files and text passages containing the word ‘obesity’. Consequently, the suppressed thoughts become even more conscious through so-called ‘ironic processes’ that overload the individual’s mental processes and thus paradoxically the unwanted behaviour (e.g., eating more of a favourite snack having abstained from it for 24 h) [15].

To conclude, assessing dietary restraint attitudes in obesity clinics is relevant as it can guide our understanding of abnormal eating behaviour. If obesity specialists advise children to restrain their eating but fail i) to make this specific or ii) to duly recognize the history of past dietary restraint attitudes, it is possible that more rigid dieting intentions may ensue, resulting in potential psychological side-effects and loss of control [12].

Emotional Eating

Do you sometimes eat snacks when you are feeling alone or bored?

The consumption of ‘comfort food’ (energy-dense food due to high sugar and fat content) is often seen as a kind of avoidant stress coping. Stress arises when the demands of a situation exceed an individual’s ability to cope and resolve the problem, resulting in emotional, behavioural and cognitive disturbances [16]. Besides life events, daily minor hassles are also seen as important stressors. Children who are obese often display body dissatisfaction and social isolation as stressors [17].

Feelings of stress can affect the eating behaviour [18, 19] during meals or via snacking. Specifically under mild stress, more eating is observed in 30–43% of adults and adolescents [18] leading to unhealthy food choices, high fat and sugar intake, eating in the absence of hunger and a more unbalanced eating pattern. For adolescents with a genetic risk for overweight this is seen as problematic [19]. Moreover, when the stress is accompanied by feelings of loss of control, it can lead to binge eating even in the absence of dietary restraint attitudes. Finally, stress induces increased negative mood, and this is related with poorer outcome in obesity treatment in some [20] but not all studies [5].

These observations can be explained by the ART which proposes that affective processes play an important role in eating behaviour, here defined as emotional eating [16]. ART postulates that particularly eating in the absence of hunger is to be seen as an effort to regulate aversive mood because i) food provides comfort on a psychological level, ii) reduces arousal on a biological level, iii) distracts people from their emotional state and iv) overshadows negative affects [16].

To conclude, besides assessing eating disorder symptoms and potential dietary antecedents, assessing emotional eating and – if possible – exploring its potential underlying factors (e.g., stressors, low self-esteem, negative mood, body dissatisfaction or social isolation) is relevant as it can guide our understanding of a second acknowledged pathway that leads to disturbed eating behaviour. With regard to treatment, ‘emotional eaters’ will need to develop self-control skills to cope with food in the absence of hunger and to manage emotional eating by identifying and understanding their underlying antecedents. In cases where the child suffers from severe stressors, it is recommended to collaborate with a psychologist.

Craving and Addiction

Is your eating sometimes disinhibited after you have seen or smelled food?

Do you feel uncomfortable when you have not enough food at your disposal?

Besides the above-mentioned DRT and ART, according to psycho-biological theories some children who are obese may also show increased physical responsiveness to food in the absence of dieting attitudes or emotions. In these children, the smell, the taste and the presentation of food lead to an immediate reaction (i.e., eating while ignoring internal feelings of satiety) which can be characterized as reward-sensitive [21–24]. There is some evidence that individuals with obesity find palatable foods more rewarding than non-obese [25], but it remains unclear why this is so.

According to Gray's reinforcement sensitivity theory (RST) [22], reinforcement sensitivity reflects functional outcomes of the behavioural activation system which is organized primarily by the neurotransmitter dopamine. Imaging research in adults found that reinforcement sensitivity significantly predicted activation to appetizing foods (relative to bland foods) in brain areas implicated in food reward [24]. Additionally, functional magnetic resonance imaging (fMRI) data indicates that obese youths show greater activation in brain reward areas in response to visual food stimuli and in response to food consumption compared to lean counterparts [25]. These abnormal responses persist even after weight reduction. We assume that RST can explain a third mechanism underlying disturbed eating. Reward sensitivity can be measured not only via questionnaires but also by specific tasks. For example, it was proven in a Stroop task that, compared to controls, children who were obese displayed an attentional bias for food cues, which was not observed for neutral cues [26]. It was hypothesized that the observed bias reflects hypersensitivity for food cues, which can initiate or maintain dysfunctional eating.

It is important to be aware that resisting temptation for (food) rewards requires self-regulatory resources. As a result, overeating by highly reward-sensitive individuals can also be seen as a limitation of self-regulation skills through which impulses and immediate reward will rule over secondary considerations and long-term consequences [27]. Research proposes that parallels exist between obesity and ADHD in children [28, 29] as well as between obesity and other potentially addictive behaviours which are characterized by impulsive behaviour as the result of a rise in sensitivity to reward and a lack of self-regulation skills [30].

In addition, preliminary evidence described the similarities between substance dependence and disordered eating behaviour such as loss of control or overconsumption and inability to successfully cut down on consumption despite health complications and wishing to do so [31, 32]. However, the 'addiction' hypothesis is criticized as well. Abstinence symptoms, inevitably prevalent after substance abuse, have not yet been observed after overeating. Moreover, the link with addiction seems to have been ruled out recently since accurate use of fMRI shows that drugs mainly stimulate the ventral striatum and tobacco the dorsal striatum while obesity per se does not stimulate this area. Until now, the main evidence for addiction to certain food groups emanates from work with animal models where sugar consumption has been linked with behavioural indicators of dependence [33]. However, this area is a developing field, and data should be considered with caution.

We can conclude that, even in the absence of dietary restraint or emotional eating, some adolescents who are obese show an increased responsiveness to food, sometimes observed as cravings and addiction to overeating. The presence of such 'reward-driven' cravings should be considered as another, probably third pathway contributing to disordered eating behaviour. In treatment, we must be aware that resisting temptation requires enduring self-regulatory skills which can be extremely difficult to develop for children who are obese with high reward-sensitive traits even when motivated to lose weight.

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Obesity is an Expression of a Family Pathology or a Comorbid Psychopathology

Has the child other problems besides obesity?

Does the family report that this child is difficult to educate?

Several authors emphasize the importance of the role of the family in the development and maintenance of obesity in children. Parents sometimes report a stressful family dynamic or indicate that the child demonstrates aggressive or coercive behaviour if rules are to be followed [34–40]. Although the dynamics between parent and child are difficult to unravel, there are three alternative mechanisms to consider.

First, parenting style in general and feeding style in particular are crucial factors in fostering a healthy lifestyle, promoting awareness of internal hunger and satiety cues and de-emphasizing extreme aesthetic thinness [37]. There is, for example, evidence that lowering the caloric load by increasing the proportion of wholemeal products or reduction of foods ‘tolerated’ in healthy-weight persons can have positive effects in adolescents who are obese [5]. It is possible that parents of a child with a history of obesity find it more difficult to effectively implement food rules on a daily basis compared to parents of other children and therefore may ultimately use less adequate parenting skills [34–36]. For example, Moens et al. [38] reported that, although parents of children who were overweight stated they were exerting more control on their children’s feeding behaviour and an equal amount of parental support in comparison with parents of lean children, objective observations at mealtime indicated that in families of an overweight child, permissive and maladaptive control strategies were twice as likely and less parental support was displayed.

In the 1970s, Hilde Bruch [39] reported the presence of ineffective rules and discipline in families with children who are obese. Parents often use food to reinforce a child’s desirable or undesirable behaviour, and this can have adverse side-effects. Also the opposite is observed in a hostile family climate where there may be subtle signs of emotional abuse. Population-based studies are needed before we can generalize these findings to all families with an obese child. We also need longitudinal studies in order to understand if i) ineffective parenting and ii) a dysfunctional family climate can trigger or sustain an obesity problem.

Second, Favaro and Santonastaso [40] found that psychiatric symptoms in mothers, unlike in fathers, were associated with the severity of obesity in their children.

Third, some children face greater challenges in receiving education than others. Such challenges include an irritable or reactive temperament in young childhood, more internalizing symptoms (e.g., more anxious feelings, more depressed mood, more psychosomatic complaints) or more externalizing symptoms (e.g., more impulsive behaviour, more aggression, more oppositional behaviour) [41]. Since the beginning of obesity research, not only psychological problems but also mental health disorders have been observed in children who are obese, and it remains uncertain how psychiatric comorbidities are related to obesity [41–43]. One way of testing the link is by evaluating what happens if the child’s obesity problem is treated. In a study by Van Vlierberghe et al. [43], it was shown that a substantial number of adolescents still suffered from mental health problems after completing obesity treatment. Meta-analyses indicate a bi-directional process whereby mental health disorders can be either a contributing cause of obesity or a side-effect thereof [44]. Although several theories based on longitudinal research exist to understand the development of mental health problems in a child and their family, we propose the diathesis-stress model (DSM) for understanding mental health problems in children with obesity. In line with others [45], we propose that being overweight in early life in a western society which promotes the thin ideal might lead to negative feedback and low self-esteem and that this can form a ‘scar’ (a diathesis), making these children more vulnerable when confronted with new stressors (like bullying or family conflicts). Later in life, during the transition to adolescence new school demands, peer

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relations, 'leaving home' and autonomy are expected, thus challenging the child's survival skills and possibly leading to the development of psychopathology in vulnerable individuals confronted with stress. In line with this so-called diathesis-stress perspective on psychopathology, the 'spirit of the times hypothesis' [45] (characterized by a thin ideal and strong expectations regarding school and social performances for all children) predicts a general increase in psychological problems in overweight individuals as both a breeding ground for diatheses and higher stress levels are created.

To conclude, irrespective of the relationship between mental health problems and overweight and with respect to the incidence of stigmatization towards overweight people in western society, screening for family problems and both internalizing and externalizing symptoms appears to be appropriate. In practice, when parents complain they have a 'difficult child', it will be necessary to help the parents understand their child and strengthen their parenting skills.

Recommendations for a Psychological Screening in a Paediatric Obesity Clinic

Although National Institute for Health and Care Excellence (NICE) guidelines [46, 47] on the clinical assessment of childhood obesity and eating disorders are informative, they lack specific detail. As such, the present recommendations could be seen as an extension of the guidelines (see [46] pp 38–41 and [47] p 9).

Translated to the paediatric obesity practice, our proposed approach involves three stages: after indications of eating problems during an initial interview (stage 1) a screening session is organized with the agreement of the parents and with rating scales or questionnaires to select potential cases for further assessment by means of a cut-point score (stage 2). Third, a referral for further assessment is indicated for those participants exceeding the cut-points whereby a second administration of the questionnaires and a structured interview by a trained psychologist is recommended (stage 3). As families may often not be aware of the importance of eating behaviour and underlying psychological health for their child's overall health, it will be important for the clinician to highlight how obesity can affect multiple domains of health. Because there may be an initial lack of acceptance of questioning or assessment of these issues, the clinician must always approach the issue with sensitivity. It is imperative that the clinician addresses the child and family in an appropriate, child-friendly manner using understandable language and concepts. Fostering an environment of support and understanding is essential in order to gain accurate insight into child and family life and for establishing trust early on.

Stage 1 of Assessment

In order to conduct an evidence-based holistic assessment of children and adolescents who are clinically obese, we propose that a number of general questions be used in stage 1 to capture whether or not eating behaviour is disturbed. Such screening questions can address the aforementioned psychological models (M) which appear to underpin disordered eating in children who are obese. If one of the following five questions elicits a positive response, stage 2 of the psychological screening may be indicated:

M1. Does the child report eating large amounts of food or loss of control over his/her eating?

M2. Is the child preoccupied with restricting food, dietary restraint attitudes or severe weight and shape concerns?

M3. Does the child reveal emotional eating patterns? Has this been observed by the parent?

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M4. Does the child show a higher degree of disinhibition, display a specific responsiveness to food cues or report to be addicted to overeating?

M5. Are there family problems related with the parenting situation of the child, or does the child show internalizing or externalizing problems?

Stage 2 of Assessment

To identify at-risk children, mental health professionals need reliable and valid screening methods for further identifying behavioural and emotional problems in children. In-depth observations or interviews are generally neither very reliable nor cost-effective [48, 49]. Therefore, rating scales are seen as ‘gold standards’ for monitoring youth with potential mental health problems via parental report (all ages) or child report (all children ≥ 8 years) and to highlight potential cases for further psychological assessment. To make it easy for clinicians to judge children’s functioning, each scale score of a screening instrument is only relevant when it refers to percentiles or T-scores that enable to compare a specific child’s raw score with normative samples. Also cut points are important markers for identifying an at-risk child. For example, Achenbach et al. [49] who developed one of the most widely used screening instruments for psychological problems in children suggest that a T-score on the broad-band scales greater than 63 is the cut point and generally indicative of problematic behaviour.

Although rating scales are designed to provide information about the presence and severity of psychological symptoms, they cannot by themselves yield a diagnosis. Specificity and sensitivity still vary across instruments, with an estimated sensitivity of 0.66 and an estimated specificity of 0.83, indicating that numbers of false-positive and false-negative results are still quite large [48, 49]. Therefore, the use of a ‘multiple-stage’ strategy in the assessment of psychopathology has been recommended.

We suggest to use age-appropriate screening measures which verify the answers elicited by the five interview questions in stage 1. A variety of psychological questionnaires (10 min each), tasks (20 min each) and interviews (45 min each) can be used. Some measures are completed by the child and some by the parents, and for some both a child and parent version is available. Multi-informant testing with both the child’s and the parent’s perception on the same domains is always better compared with one perspective. For each hypothesis there is a number of outcome measures with established psychometric properties (see further details on the website of the European Childhood Obesity Group (ECOG)). However, we cannot burden a paediatric consult with too many tests and interviews for a child. In stage 2 of assessment, we recommend that the clinician screens for the different psychological models using only one instrument for the child and one for the parent. For this task, for example the Dutch Eating Behaviour Questionnaire (DEBQ) (child version) combined with the Child Behavior Checklist (CBCL) (parent version) is most efficient as it can help to test 4–5 models at once [49, 50]. Based on the resulting scores of the DEBQ and CBCL, moving to stage 3 of assessment may be indicated.

Stage 3 of Assessment

Where disordered eating is identified during stage 1 and stage 2 of clinical assessment, if there appear to be difficulties within the child or the home environment that could interfere with the treatment and when the assessing clinician does not feel adequately skilled, it is appropriate to discuss with the parents the option of referring the child and family to a suitably qualified paediatric psychologist for more in-depth assessment and treatment (stage 3). Completing stage 3 of assessment will vary in centres depending on access to psychology experts. A qualified paediatric psychologist means that this expert received scientific training in evidence-based assessment and treatment (preferably with a cognitive-behavioural

approach) or in some of the well-evaluated family therapy models. Initial assessment may also identify cases where the parents require additional assessment and support for themselves (e.g. to address coping skills, parenting skills, substance dependence, depression etc.) making referral to adult specialists advisable. In stage 3, we recommend screening the psychological models via the following outcome measures:

For M1–M3: Besides the DEBQ child, a second instrument is the DEBQ parent version. If possible, double-check with a standardized interview.

For M4: Besides the DEBQ child, a second instrument is the DEBQ parent version. If possible, double-check with Behavioural Inhibition System (BIS) / Behavioural Activation System (BAS) scales [23].

For M5: For assessing family problems, use parental rejection measures. If possible, double-check the child's perspective via interview or observation. For assessing mental health problems in a child, the CBCL is a good instrument. If means are available, double-check with an interview.

Upon completion of the 3 proposed stages of assessment, the team will have a better understanding regarding the optimal treatment the child/family needs. Based on the assessment outcome, onward referral may be warranted.

Red Flags for Onward Referral

If initial screening identifies any issues where child protection might be of concern (emotional abuse, physical abuse, bullying, self-harm or life-threatening issues), it is recommended that prompt referral to appropriate services is undertaken. Also, if the child gains or loses considerable weight in a period of 6 months or has problems in the physical processes of eating such as difficulty with chewing or swallowing, referral may be indicated. Finally, some specific items included in the screening instruments can be helpful for identifying red flags that will require referral to a more specialized child/adolescent psychiatric team (e.g. vomiting, stealing food, nightmares, suicidal thoughts).

Discussion

In this review article, we summarized the different disturbed eating patterns observed in paediatric obesity and reviewed our current understanding regarding the psychological antecedents of these eating behaviours. Although multifactorial biological, societal and environmental factors influence the development and progression of obesity, there is evidence in the scientific literature regarding the plausible psychological antecedents to the development of disordered eating in children who are obese. Such factors should be considered when attempting to manage obesity in an individual child in a clinical setting. We further recommend that treatment programmes pay attention to these psychological factors as eating disturbances and their emotional precedents predict binge eating onset in adolescent girls [19] and are associated with the development of full-syndrome eating disorders. Also, eating disturbances can be linked to worse obesity treatment outcome [4–6], and binge eating itself has been associated with excessive weight gain [7]. Similarly, increased negative affect can relate to poorer obesity treatment outcome in some [20] but not all studies. When a child indicates eating behaviour in the absence of hunger, we suggest to test different possible psychological models via a three-stage approach. Such evaluation may be important in order to provide the child with optimal obesity treatment. Currently, childhood obesity interventions focus on improving impulse control by means of learning self-regulation skills such as self-obs-

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vation, self-instruction, self-evaluation and self-reward in addition to standard care (dietary as well as physical activity advice) and cognitive behavioural lifestyle intervention programmes [51]. Nevertheless, for some children who are obese, these vital skills seem to be hard to implement and maintain, particularly if they suffer from associated psychological problems. Consequently, we suggest integrating a number of psychological models into the holistic assessment:

Firstly, DRT proposes that we must help our patients to cease unhealthy dieting and pay specific attention to unhealthy eating attitudes or challenge them extensively via cognitive techniques. Secondly, the ART teaches specific emotion-focused techniques for adequate affect regulation and stress management like planning difficult situations and choosing problem solving or relaxation as alternatives to emotional eating. Finally, according to Gray's RST it is important to train impulse-control resources as such impulses are an important source of failure in self-regulation skills. Recently it was shown that novel treatments, including computer-based training, open hopeful horizons [52]. Several review papers also focused on family-based approaches in the treatment of childhood obesity. All studies (see the most recent Cochrane review [51]) point at significant and clinically meaningful weight outcomes of family-based lifestyle interventions compared to standard care in both the short and the long term. In addition, there is no question that, apart from the amount and type of food children eat, the physical fitness gained through physical activity and play is an important predictor of health, obesity and physical comorbidity. Similar to the appropriate onward referral to a psychologist for disordered eating behaviour, referral of the child to a paediatric physiotherapist for an age-appropriate physical fitness assessment will likely be indicated. Additionally, some children who are obese can be 'psychologically healthy', with no eating disorders or addiction, and have a good quality of life with preference for healthy nutrition and high intrinsic motivation for physical activity. Consequently, these children do not need extra psychological help. From other areas of prevention, we know that, in principle, salutogenic thinking is more successful than pathogenic controlling. Therefore, in future research we need to study also how we can differentiate subtypes of children according to the absence or presence of certain symptoms.

No psychological variables are identified as etiological factors in childhood obesity. However, the psychological frameworks identified may be important for understanding the associated psychological comorbidities that can interfere with obesity treatment even in motivated children. Given the importance of optimizing evidence-based obesity interventions, we propose that all children being assessed for clinical obesity are screened for eating disturbances. Further, we recommend that research examining the psychological factors related to the development of eating in the absence of hunger be undertaken. In general, psychological screening must avoid causing harm, and our suggested screening questions as well as our three-stage approach can assist clinicians in their systematic screening of disturbed eating behaviour. This method of screening should be tested, however, and future research on the effects of such an approach on the child, on the family and on treatment outcome is warranted.

Disclosure Statement

The authors report no conflicts of interest.

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